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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/713,830 11/15/00 FURUKAWA

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EXAMINER

MMC2/1107

IBM CORPORATION
INTELLECTUAL PROPERTY LAW, 972E
1000 RIVER STREET
ESSEX JUNCTION VT 05452

QUINTO, K

ART UNIT

PAPER NUMBER

2826

DATE MAILED:

11/07/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/713,830

Applicant(s)

FURUKAWA ET AL.

Examiner

Kevin Quinto

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 August 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-43 is/are pending in the application.
- 4a) Of the above claim(s) 22-43 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 9, 10 and 12-19 is/are rejected.
- 7) ☒ Claim(s) 5-8, 11, 20 and 21 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 August 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other _____

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-21, drawn to a FET, classified in class 257, subclass 327.
 - II. Claims 22-43, drawn to a method of making a semiconductor device, classified in class 438, subclass 299.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions II and I are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the undefined method of forming the gate dielectric could be done by thermal oxidation.
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.
4. During a telephone conversation with Richard Henkler (Reg. No. 39,220) on November 2, 2001 a provisional election was made without traverse to prosecute the invention of the FET, claims 1-21. Affirmation of this election must be made by applicant in replying to this Office action. Claims 22-43 withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

6. Claims 1-4, 9, 10, 12, 16, and 19 are rejected under 35 U.S.C. 102(e) as being anticipated by Lur et al (USPN 5,981,383).

7. Regarding claim 1, Lur et al. (USPN 5,981,383, hereinafter referred to as the "Lur" reference) discloses a similar device. Figure 15 of Lur illustrates a FET with a gate (56, 74) having a top portion which is wider than the bottom portion. There is a diffusion (64) self-aligned to the bottom portion.

8. Claims 2-4 are product-by-process claims:

Note that a "product by process" claim is directed to the product per se, no matter how actually made, *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See also *In re Thorpe*, 227 USPQ 964, 966; *In re Luck*, 177 USPQ 523; *In re Fessmann*, 180 USPQ 324; *In re Avery*, 186 USPQ 161; *In re Wertheim*, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); and *In re Marosi et al.*, 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above case law makes clear. See also MPEP 2113.

Claims 2-4 do not distinguish over the Lur reference regardless of the process used to create the halo implant, because only the final product is relevant, and not the process of making such as the halo diffusion being the first implantation step or the implantation being carried out at an

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angle from the normal to create the halo diffusion. Regarding claim 3, the halo region is the only structural limitation which is cited. Lur contains a halo region (66) as seen in figure 15.

9. Regarding claim 9, figure 15 of Lur discloses a similar device. The gate has a first conductive material or lower portion (58, which is pointing to the gate dielectric in figure 15 but it is clear that 58 should be pointing to the lower portion of the gate as seen in figures 11-14) made of polysilicon. The second conductive material or upper portion (74) is made of titanium silicide.

10. Regarding claim 10, figure 15 of Lur shows that the first conductive material (58) is on a gate dielectric (56, which is pointing to the lower portion of the gate in figure 15 but it is clear that 56 should be pointing to the gate dielectric as seen in figures 11-14). The gate dielectric (56) is on the substrate (10).

11. Regarding claims 12 and 16, the first conductive material (58) is polysilicon (column 8, lines 41-43).

12. Regarding claim 19, the second conductive material is (74) is a silicide (column 8, lines 41-43).

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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14. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lur et al. (USPN 5,981,383) in view of Sagnes (USPN 5,998,289).

15. Regarding claim 13, Lur does not disclose the use of germanium as a material in the gate electrode. However the use of germanium as a gate electrode is well known in the art. Sagnes (USPN 5,998,289) discloses that using germanium in the gate electrode provides the benefit of compatibility with both n and p type transistors which leads to a more efficient fabrication process (column 1, lines 26-32). It would therefore be obvious to utilize germanium in the gate electrode of Lur in order to attain this benefit.

16. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lur et al. (USPN 5,981,383) in view of Naruse et al. (USPN 5,356,821).

17. Regarding claim 14, Lur does not disclose the use of a germanium compound ($\text{Ge}_x\text{Si}_{1-x}$ with $0.5 < x < 1.0$) as a material in the gate electrode. However the use of a germanium compound ($\text{Ge}_x\text{Si}_{1-x}$) as a gate electrode is well known in the art. Naruse et al. (USPN 5,356,821, hereinafter referred to as the "Naruse" reference) discloses that using a germanium compound ($\text{Si}_{1-x}\text{Ge}_x$) in the gate electrode provides the benefit of lower resistance (column 7, lines 18-29). Naruse discloses an example where $x = 0.52$ (column 7, lines 18-21); thus meeting the limitation where $0.5 < x < 1.0$. Naruse also discloses that as germanium content increases, the resistance decreases (column 7, lines 22-25). It would therefore be obvious to utilize a germanium compound ($\text{Ge}_x\text{Si}_{1-x}$ where $0.5 < x < 1.0$) in the gate electrode of Lur in order to attain the benefit of lower resistance.

18. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lur et al. (USPN 5,981,383) in view of Price et al. (USPN 4,570,328).

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19. Regarding claim 15, Lur does not disclose the use of polysilicon as the second conductive material in the gate electrode. However the use of polysilicon as material in a gate electrode is well known in the art. Price et al. (USPN 4,570,328, hereinafter referred to as the "Price" reference) discloses that using polysilicon in the gate electrode provides the benefit of compatibility with the high temperature processes which take place after the electrode and interconnect fabrication (column 1, lines 19-34). It would therefore be obvious to utilize polysilicon as the second conductive material in the gate electrode of Lur in order to attain this benefit.

20. Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lur et al. (USPN 5,981,383) in view of Rodder (USPN 6,087,248).

21. Regarding claims 17 and 18, Lur does not disclose the use of a refractory metal as the second conductive material in the gate electrode. However the use of a refractory metal as material in a gate electrode is well known in the art. Rodder (USPN 6,087,248) discloses that using a refractory metal such as tungsten in the gate electrode provides the benefit of being able to withstand the later high temperature processes (column 4, lines 32-38). It would therefore be obvious to utilize a refractory metal, such as tungsten, as the second conductive material in the gate electrode of Lur in order to attain this benefit.

Allowable Subject Matter

22. Claims 5-8, 11, 20 and 21 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

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Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin Quinto whose telephone number is (703) 306-5688. The examiner can normally be reached on M-F 8AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (703) 308-6601. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

KVQ
November 5, 2001


Nathan Flynn
Primary Examiner